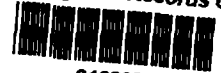


U.S. ENVIRONMENTAL PROTECTION AGENCY
SUPERFUND DIVISION
77 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

9000850

EPA Region 6 Records Ctr.



216837

DATE: June 25, 2004

SUBJECT: Soil Sampling Results, Himco Dump, Elkhart, Indiana

FROM: Larry Jensen, CHP
Senior Health Physicist
Field Services Section

TO: Gwen Massenburg
Remedial Project Manager
Remedial Response Section 5

This memo is a revision to the one I sent on May 21, 2004. It was recently discovered that the laboratory report previously received from the U.S. Environmental Protection Agency's (USEPA) radiation laboratory (the National Air and Radiation Environmental Laboratory, NAREL) had inadvertently omitted some data. *This new memo will discuss the sample results in light of the full data report (see attached Appendix and Laboratory Results).*

On March 17, 2004, a radiation survey at the Himco Dump in Elkhart, Indiana, was made with you, myself and staff of the Indiana State Department of Health, Indoor and Radiologic Health Division. Gamma-ray count rates were generally similar, at background levels, over the site with the exception of two deposits of black material in a trench adjacent to County Road 10 (or Bristol Road). To determine the identity and concentration of the radioactive materials in these deposits, *two soil samples were taken and sent to the USEPA's NAREL for gamma spectrometric analysis.*

Results are shown in the Appendix and the Laboratory Results sections. Radionuclides identified are those in the Uranium Decay Series, the Thorium Decay Series, and the Actinium Decay Series. These are all naturally occurring radioactive materials. Also identified were potassium-40, a naturally occurring radionuclide, and cesium-137, a remnant of atmospheric testing of nuclear weapons.

The Uranium Decay Series, Sample #1, Sample #2 and Sample #2 Duplicate ^ show data consistent with natural background concentrations *. Actual radium-226 levels are

^ Duplicate means the same sample was counted a second time.

* The United Nations Scientific Committee on the Effects of Atomic Radiation, in their 1993 publication on page 65, Table 5, shows the Uranium Decay Series concentrations in soil range from 0.1 - 3.8 picocuries per gram and the Thorium Decay Series concentrations in soil range from 0.1 - 3.5 picocuries per gram.

believed to not be as high as shown due to interference from uranium-235. Specifically, because the gamma-ray energies for both radionuclides are too close, levels for one may be attributed to the other. Also, the levels for lead-214 and bismuth-214 may be slightly higher than shown because there were only 20 days from the time of collection to the time of counting in the laboratory. It takes about 30 days for lead-214 and bismuth-214 to build to the full equilibrium concentration. Consequently, Sample #1 appears to be about 2 - 3 picocuries per gram (pCi/g) and Sample #2 appears to be about 4 - 5 pCi/g. Although the levels for Sample #2 are at the top of the normal range (or may slightly exceed it), I see no indication that these are contaminant levels.

For the Thorium Decay Series, all the expected radionuclides are present at levels that would be reasonable for normal soils*. Sample #2 levels are higher than Sample #1 levels but not so high that they would not be out of the normal range in soils and rocks. Consequently, no Thorium Decay Series contamination is evident in the Himco Dump samples.

For the Actinium Decay Series (uranium-235), the levels do not show contamination although some of the results need explanation. In general, the Actinium Decay Series is not easy to measure and the results commonly vary from expectations.

Expected concentrations are based upon the fact that Actinium Decay Series activity levels would, in natural, undisturbed, settings, be about 4.6% of Uranium Decay Series activity levels. This would be about 0.9 pCi/g for Sample #1 and about 1.8 pCi/g for Sample #2 and Sample #2 Duplicate. Where uranium-235 concentrations are higher, this may be due to the interference with radium-226 discussed earlier. Where radium-223 concentrations are higher, this may be due to a similar interference effect from actinium-228 and thorium-228 in the Thorium Decay Series.

Although radon-219 was detected and measured, it is a difficult constituent to rely on because it is a gas and can easily be lost out of the sample container. Lead-211 is produced by radon-219 so if radon-219 is not reliable, neither will be lead-211. Therefore, these results should be discounted.

My judgment is that no contamination is evident from the Actinium Decay Series data.

Overall, I see no evidence of contamination in these samples.

* The United Nations Scientific Committee on the Effects of Atomic Radiation, in their 1993 publication on page 65, Table 5, shows the Uranium Decay Series concentrations in soil range from 0.1 - 3.8 picocuries per gram and the Thorium Decay Series concentrations in soil range from 0.1 - 3.5 picocuries per gram.

Appendix

Himco Dump, Elkhart, Indiana			
Uranium Decay Series			
Thorium-234	1.98	3.64	
Protactinium-234m	----	----	4.17
Radium-226	3.46	5.25	5.08
Lead-214	1.89	3.81	3.74
Bismuth-214	1.81	3.48	3.47
Lead-210	----	1.22	----
Thorium Decay Series			
Radium-228	0.957	1.87	1.69
Radium-224	0.559	1.47	1.53
Lead-212	0.980	1.86	1.83
Bismuth-212	0.999	1.93	1.79
Thallium-298	0.320	0.563	0.551
Thallium-208/0.36	0.889	1.56	1.53
Actinium Decay Series			
Uranium-235	0.214	0.0956	0.136
Thorium-227	----	0.148	----
Radium-223	0.0673	0.526	----
Radon-219	0.0903	0.150	0.229
Lead-211	----	0.333	----
Other Radionuclides			
Potassium-40	15.2	22.9	23.0
Cesium-137	0.0244	0.0130	0.0124

Laboratory Results

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #0400010

Project: HIMCO DUMP
Analysis Procedure: Gamma Spectrometry
Date Reported: 04/15/2004

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A4.01624K	TRENCH E OF CDA, #1	SAM	SOIL	03/18/2004	04/02/2004
A4.01625L	TRENCH E OF CDA, #2	SAM	SOIL	03/18/2004	04/02/2004

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Mary F. Wisdom
Quality Assurance Coordinator

Date

John Griggs, Ph.D.
Chief, Monitoring and Analytical Services Branch

Date

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Bi-214, Pb-214, Th-234, Pa-234m, Ra-226, Th-231, and U-235 are subject to greater possible uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma counting uncertainty which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010**

ANALYSIS SUMMARY

Analysis Procedure: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A4.01624K		N/A	04/08/2004	0008558W	0003210M
A4.01625L		N/A	04/08/2004	0008558W	0003210M
A4.01625L	DUP	N/A	04/10/2004	0008558W	0003210M

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010**

SAMPLE ANALYSIS REPORT

Sample #:	A4.01624K	QC batch #:	0003210M
Matrix:	SOIL	Prep batch #:	0008558W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.590e+03 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
04/07/2004 12:44	1000.0	GE17	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		9.7e-02	PCI/GDRY	03/18/2004
Bi212	9.99e-01	9.2e-02		PCI/GDRY	03/18/2004
Bi214 *	1.81e+00	1.0e-01		PCI/GDRY	03/18/2004
Co60	ND		1.2e-02	PCI/GDRY	03/18/2004
Cs137	2.44e-02	5.1e-03		PCI/GDRY	03/18/2004
I131	ND		5.1e-02	PCI/GDRY	03/18/2004
K40	1.52e+01	8.7e-01		PCI/GDRY	03/18/2004
Pb212	9.80e-01	5.7e-02		PCI/GDRY	03/18/2004
Pb214 *	1.89e+00	1.1e-01		PCI/GDRY	03/18/2004
Ra223	6.73e-02	3.1e-02		PCI/GDRY	03/18/2004
Ra224	5.59e-01	1.2e-01		PCI/GDRY	03/18/2004
Ra226 *	3.46e+00	2.3e-01		PCI/GDRY	03/18/2004
Ra228	9.57e-01	5.7e-02		PCI/GDRY	03/18/2004
Rn219	9.03e-02	2.7e-02		PCI/GDRY	03/18/2004
Th234 *	1.98e+00	1.4e-01		PCI/GDRY	03/18/2004
Tl208	3.20e-01	1.9e-02		PCI/GDRY	03/18/2004
U235 *	2.14e-01	1.4e-02		PCI/GDRY	03/18/2004

* An asterisk indicates a result whose value may be significantly over or underestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010**

SAMPLE ANALYSIS REPORT

Sample #:	A4.01625L	QC batch #:	0003210M
Matrix:	SOIL	Prep batch #:	0008558W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.160e+03 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
04/07/2004 12:45	1000.0	GE18	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		1.2e-01	PCI/GDRY	03/18/2004
Bi212	1.93e+00	1.4e-01		PCI/GDRY	03/18/2004
Bi214 *	3.48e+00	2.0e-01		PCI/GDRY	03/18/2004
Co60	ND		9.6e-03	PCI/GDRY	03/18/2004
Cs137	1.30e-02	6.0e-03		PCI/GDRY	03/18/2004
I131	ND		6.4e-02	PCI/GDRY	03/18/2004
K40	2.29e+01	1.3e+00		PCI/GDRY	03/18/2004
Pb210	1.22e+00	3.2e-01		PCI/GDRY	03/18/2004
Pb211	3.33e-01	2.2e-01		PCI/GDRY	03/18/2004
Pb212	1.86e+00	1.1e-01		PCI/GDRY	03/18/2004
Pb214 *	3.81e+00	2.2e-01		PCI/GDRY	03/18/2004
Ra223	5.26e-01	5.2e-02		PCI/GDRY	03/18/2004
Ra224	1.47e+00	1.9e-01		PCI/GDRY	03/18/2004
Ra226 *	5.25e+00	3.4e-01		PCI/GDRY	03/18/2004
Ra228	1.87e+00	1.1e-01		PCI/GDRY	03/18/2004
Rn219	1.50e-01	4.5e-02		PCI/GDRY	03/18/2004
Th227	1.48e-01	3.3e-02		PCI/GDRY	03/18/2004
Th234 *	3.64e+00	2.4e-01		PCI/GDRY	03/18/2004
Tl208	5.63e-01	3.3e-02		PCI/GDRY	03/18/2004
U235 *	9.56e-02	1.1e-02		PCI/GDRY	03/18/2004

* An asterisk indicates a result whose value may be significantly over or underestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010**

SAMPLE ANALYSIS REPORT

Sample #:	A4.01625L	QC batch #:	0003210M
Matrix:	SOIL	Prep batch #:	0008558W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.160e+03 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	DUP

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
04/09/2004 15:10	1000.0	GE17	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		1.4e-01	PCI/GDRY	03/18/2004
Bi212	1.79e+00	1.5e-01		PCI/GDRY	03/18/2004
Bi214 *	3.47e+00	2.0e-01		PCI/GDRY	03/18/2004
Co60	ND		1.8e-02	PCI/GDRY	03/18/2004
Cs137	1.24e-02	6.5e-03		PCI/GDRY	03/18/2004
I131	ND		7.7e-02	PCI/GDRY	03/18/2004
K40	2.30e+01	1.3e+00		PCI/GDRY	03/18/2004
Pa234m *	4.17e+00	8.6e-01		PCI/GDRY	03/18/2004
Pb212	1.83e+00	1.1e-01		PCI/GDRY	03/18/2004
Pb214 *	3.74e+00	2.1e-01		PCI/GDRY	03/18/2004
Ra224	1.53e+00	2.0e-01		PCI/GDRY	03/18/2004
Ra226 *	5.08e+00	3.6e-01		PCI/GDRY	03/18/2004
Ra228	1.69e+00	9.9e-02		PCI/GDRY	03/18/2004
Rn219	2.29e-01	6.2e-02		PCI/GDRY	03/18/2004
Tl208	5.51e-01	3.3e-02		PCI/GDRY	03/18/2004
U235 *	1.36e-01	1.4e-02		PCI/GDRY	03/18/2004

* An asterisk indicates a result whose value may be significantly over or underestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010**

QC BATCH SUMMARY

QC batch #: 0003210M
Preparation procedure: N/A
Analysis procedure: NAREL GAM-01

NAREL Sample #	QC Type	Yield (%)	$\pm 2\sigma$ Uncertainty (%)	Analyst
A4.01624K	DUP	N/A		RCL
A4.01625L		N/A		RCL
A4.01625L		N/A		RCL

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010**

PREPARATION BATCH SUMMARY

SAMPLES ANALYZED

NAREL Sample #	QC Type	Aliquot Size	Completion Date	Prep Batch
A4.01624K	DUP	1.59e+03 GDRY	04/08/2004	0008558W
A4.01625L		1.16e+03 GDRY	04/08/2004	0008558W
A4.01625L		1.16e+03 GDRY	04/10/2004	0008558W

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010**

DETECTOR REPORT

The following were used for samples in the SDG

GE17 04/07/2004 12:44 00470772E A4.01624K
GE17 04/09/2004 15:10 00470774G A4.01625L
GE18 04/07/2004 12:45 00470773F A4.01625L

The following were used for other samples in the QC batches

None found